

STUDIES OF NEOTROPICAL CADDISFLIES XXXV:
THE IMMATURE STAGES OF
BANYALLARGA ARGENTINICA FLINT
(TRICHOPTERA: CALAMOCERATIDAE)

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Abstract.—The larva, pupa and case of *Banyallarga argentinica* Flint are described. Characteristics for distinguishing the immature stages of *Phylloicus* and *Banyallarga* are noted. The larvae are found in slowly flowing reaches of small streams in northwestern Argentina.

Resumen.—Se describen la larva, la pupa y el capullo de *Banyallarga argentinica* Flint. Se señalan las características para diferenciar los estadios inmaduros de *Phylloicus* y *Banyallarga*. Las larvas se encuentran en los márgenes de corriente lenta de los pequeños arroyos del noroeste de la Argentina.

In the Neotropical Region, three genera of Calamoceratidae are currently recognized. The genus *Phylloicus* Müller, 1880 (with synonyms *Homeoplectron* Ulmer, 1905, and *Notiomyia* Banks, 1905) is widely distributed from the southwestern United States, through the West Indies, Central America, and South America as far as southern Chile. The larvae, pupae and cases of several species were made known with the original description, and several more species have been described subsequently (Müller 1880; Thienemann 1909; Ross 1959; Flint 1964; Wiggins 1977). The second genus from the neotropics, *Banyallarga* Navás, 1916 (with synonym *Loxinum* Navás, 1934), has had its status only recently clarified (Flint 1983). The name is applied to a group of neotropical species that had mostly been placed in *Ganonema* or *Anisocentropus*. We describe here, for the first time, the larva, pupa and case of a species of this genus (the larva of an unknown species from Venezuela was noted by Botosaneanu and Flint 1982:24 as *Phylloicus* sp.). The third genus *Muriella* Hogue & Denning was only described in 1983. It is limited to Central America and Jamaica, and its immature stages are undescribed. (Flint does possess the immature stages of *M. acutiterga* Denning & Hogue, 1983.)

During field work in northwestern Argentina in 1973 Flint collected at several localities adults of the species subsequently described as *Banyallarga argentinica*. At the same time and at many of the same localities, larvae and a few pupae of a calamoceratid were found inhabiting cases distinctly different from those of *Phylloicus*. It was believed that these were probably the immature stages of *B. argentinica*, but lacking firm association they were put aside. In 1982 Angrisano collected and reared larvae of this species to the adult stage, thereby associating the immature stages of a species of *Banyallarga* for the first time. We herein describe the larvae and pupae of this species and propose characteristics whereby these stages may be distinguished from those of *Phylloicus*.

Banyallarga Navás

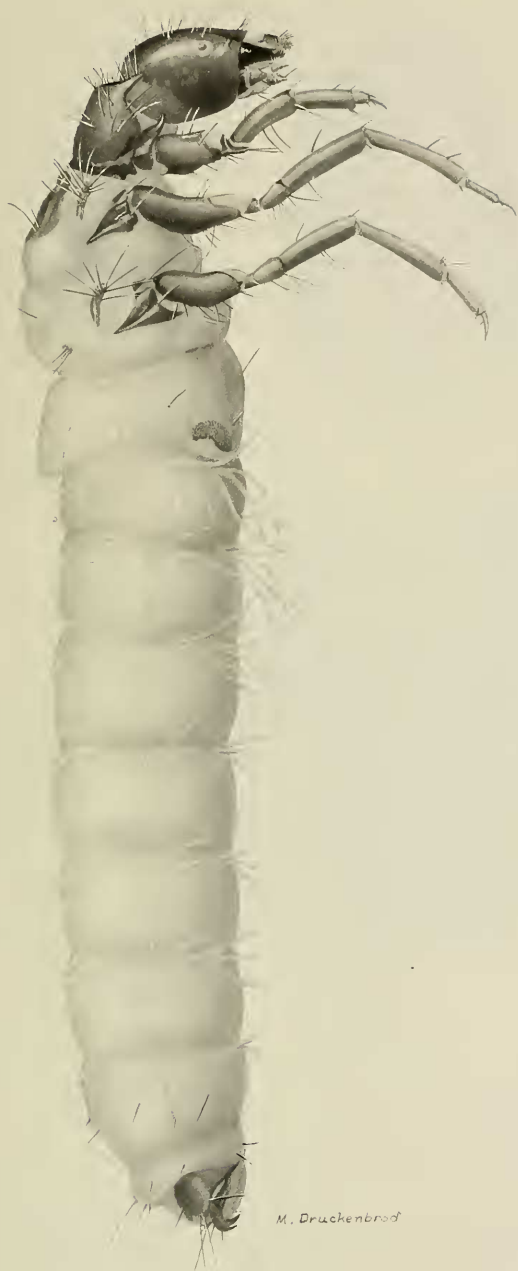
Currently the following nine species are placed in the genus: *aequatoria* (Navás) (Ecuador), *argentinica* Flint (Argentina), *columbiana* (Navás) (Colombia), *loxana* (Navás) (Ecuador), *mollicula* (McLachlan) (Venezuela), *testacea* Navás, (Colombia), *vicaria* (Walker) (Venezuela), *villosa* (Navás) (Ecuador), and *yungensis* Flint (Argentina and Peru). The overall range of the genus appears to be the Andean Mountain system of western South America from northern Venezuela to north-western Argentina.

Recognition.—In addition to the larvae of the species herein described, Flint possesses larvae of several unknown species from Argentina, Bolivia, Peru, Ecuador and Venezuela. These have all been considered and compared to many lots of *Phylloicus*, consisting of many species from throughout its range, in order to give the greatest security to the following characteristics which are proposed to distinguish the immatures of the two genera.

The general structure and shape of the larva in the two genera are virtually identical, but the following five differences appear to be consistent. The gular sclerite separating the genal halves ventrally is prolonged posteriad in *Banyallarga*, generally reaching the posterior margin of the head capsule. In *Phylloicus* this sclerite is shorter, rarely more than half or two-thirds the length of the ventral suture. The sclerite ends at, or before, the ridge separating the smooth posterior portion of the genae from the rougher anterior portion, whereas in *Banyallarga* it extends into this smooth section and generally through it to the posterior margin. All species of *Banyallarga* have a large number of setae along the anterior margin of the pronotum, generally a dozen and often several times that number. *Phylloicus* has reduced this number to about six. The trochanter of the hindleg (only) bears in *Banyallarga* a distinct brush of short hairs on the ventral margin. There is no brush in *Phylloicus*. The groove ventrally separating the metathorax from the first abdominal segment in both genera bears a small linear sclerite laterad that continues as a sclerotic area on the adjacent first segment. In *Banyallarga* this sclerotic area is very lightly sclerotized and of the same contour as the segment. In *Phylloicus*, however, it is more strongly sclerotized and generally produced into a distinct knob, or less commonly produced into an oval, elevated area; it is always produced well above the surrounding integument. Finally, and most easily seen, the gill clusters in the mature larva of *Banyallarga* consist of no more than three filaments. In *Phylloicus* the dorsal and ventral gill rows on the first few segments, at least, consist of clusters of four filaments.

In addition, the head dorsally of the larvae of *Phylloicus* is smooth. At first sight it appears to be rough, but careful orientation shows it to be smooth and shining. The cuticle, however, is composed of darker, apparently thicker, spots surrounded by paler, thinner rims. In *Banyallarga* the surface is densely covered with pointed asperites (see Fig. 4, inset). However, the larva of an unknown species from Argentina, Bolivia, and Ecuador appears to have the dorsum of the head with the same type rugosities as in *Phylloicus*.

The differentiation of the pupae in the two genera is less distinct, and the pupae of few species are known. The abdomen dorsally in *Phylloicus* bears rows of long hair along the posterior margins of segments 2 to 7, with the fringe most dense on segment 6 and only slightly less so on 7. In *Banyallarga* these fringes are lacking



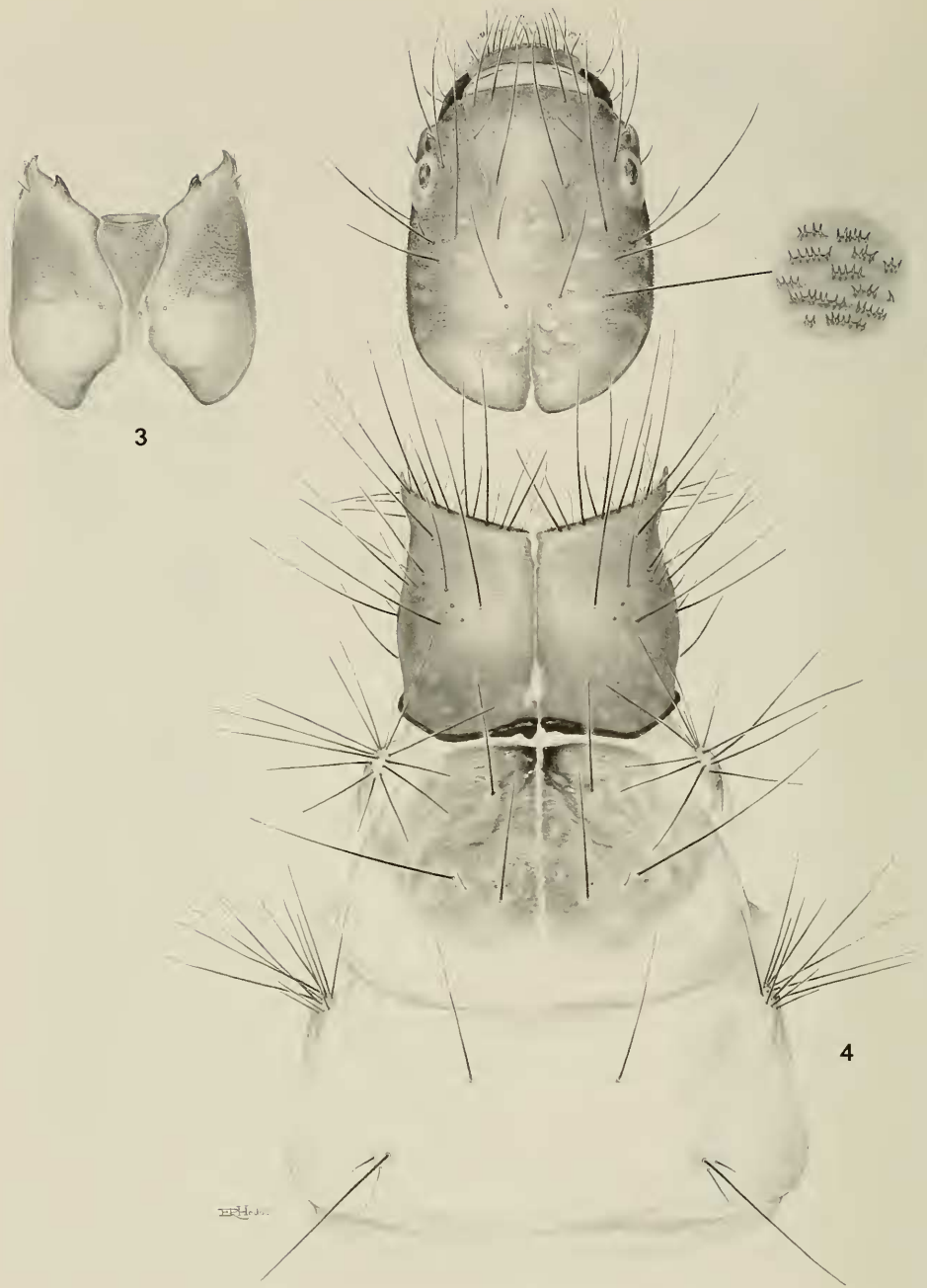
M. Druckenbrod

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Figs. 1-2. *Banyallarga argentinica*: 1, Larva, lateral; 2, Larval case, lateral. Drawings by Smithsonian staff artist, L. Michael Druckenbrod.



Figs. 3-4. *Banyallarga argentinica*, larva: 3, Head, ventral; 4, Head and thorax, dorsal with inset showing microstructure of cuticle. Drawings by Smithsonian staff artist, Mrs. Elaine R. Hodges.

on segments 2 to 5, but is well developed on 6 and consists of two pairs of fanlike arrays of stiff hairs on 7. The dorsum of segment 9 bears in both genera a pair of rather long, sclerotized processes arising from a sclerotized integumental area. In *Banyallarga* these paired processes are directed almost vertically from the integument, but in *Phylloicus* they are directed anteriorly and lay parallel, and almost appressed to, the surface.

The cases of both genera are generally distinguishable from each other. *Phylloicus* makes a flat case of leaf fragments, sometimes a single oval fragment dorsally and another ventrally, in other species a series of overlapping fragments are used dorsally and ventrally. In *Banyallarga* the case is most frequently of small rock fragments or large sand grains, but often small plant fragments are substituted. The larger pieces are generally placed along the margin, creating a case that is slightly oval in cross section, but on occasion they are perfectly round. The cases taper toward the rear and are slightly bowed lengthwise. The case of an unidentified species from Argentina, Bolivia, and Ecuador, however, is identical to that of *Phylloicus*.

Banyallarga argentinica Flint

Banyallarga argentinica Flint, 1983:77-79.

Although none of the congeneric larvae known to us is associated with their respective adults, we mention here some of the ways that they differ between the species. The head may be much shorter, barely longer than wide, and the surface is smooth in another species. The anterolateral angle of the pronotum varies greatly in shape between the species, in one species not being produced at all and in another the processes are nearly half as long as the head. The number and length of setae along the anterior margin of the pronotum also differs greatly between species. In one species the mid- and hindlegs are scarcely longer than the forelegs.

Larva.—Length to 17 mm, width to 3 mm. Sclerites of head and thorax dark reddish-brown; muscle scars of head appearing paler, smooth. Surface of head and pronotum densely covered with small raised ridges bearing row of short points, except for smooth areas over muscle scars, and posterior portion of head covered by pronotum.

Head hypognathous; lacking ridges and secondary setae; distinctly longer than wide. Labrum with well-developed anterolateral brushes; with dorsal row of about 15 erect setae. Mandibles massive, with large mesal brushes; left with 5, right with 4, poorly-developed, apical teeth. Maxilla with galeal brush well-developed; palpi short, segments subequal in length. Labium lightly sclerotized between submental setae; inner surface enlarged, with large brush. Gula with apex narrowly produced, almost completely dividing genal halves.

Pronotum with anterior margin bearing about 15 long, dark setae on each side, and equal number of shorter, paler setae; each anterolateral quarter of tergum bearing around 20 long setae; anterolateral angle produced into pointed spur; posterior margin produced into sharp carina, black. Mesonotum sclerotized dorsally, with lateral and posterior margins rather ill-defined, of characteristic shape and structure; sa1 consisting of 1 seta, sa2 of 2 long and 1 short setae, sa3 a separate anterolateral sclerite bearing around 12 long setae. Metanotum with sa1



Figs. 5-11. *Banyallarga argentinica*, larva: 5, Foreleg, lateral; 6, Midleg, lateral; 7, Hindleg, lateral; 8, Anal proleg, lateral; 9, Anal proleg, dorsal; 10, Anal proleg, posterior; 11, Anal claw, lateral.

bearing single large seta from small sclerotized base, sa2 with 1 large and 2 smaller setae from small sclerite, sa3 an anterolateral sclerite bearing around 12 long setae. Mesosternum with posterolateral, elongate sclerite. Foretrochantin produced into long, curved process, densely spiculate. Foreleg rather short, ventral margins of

3	3	3	3	3	3	3	3
	3	3	3	3	3	2-3	
	3	3	3	3	3	3	2-3
1	2	3	4	5	6	7	8

Fig. 12. *Banyallarga argentinica*, schematic gill diagram of lateral aspect of larval abdomen showing segment number and number of filaments per cluster.

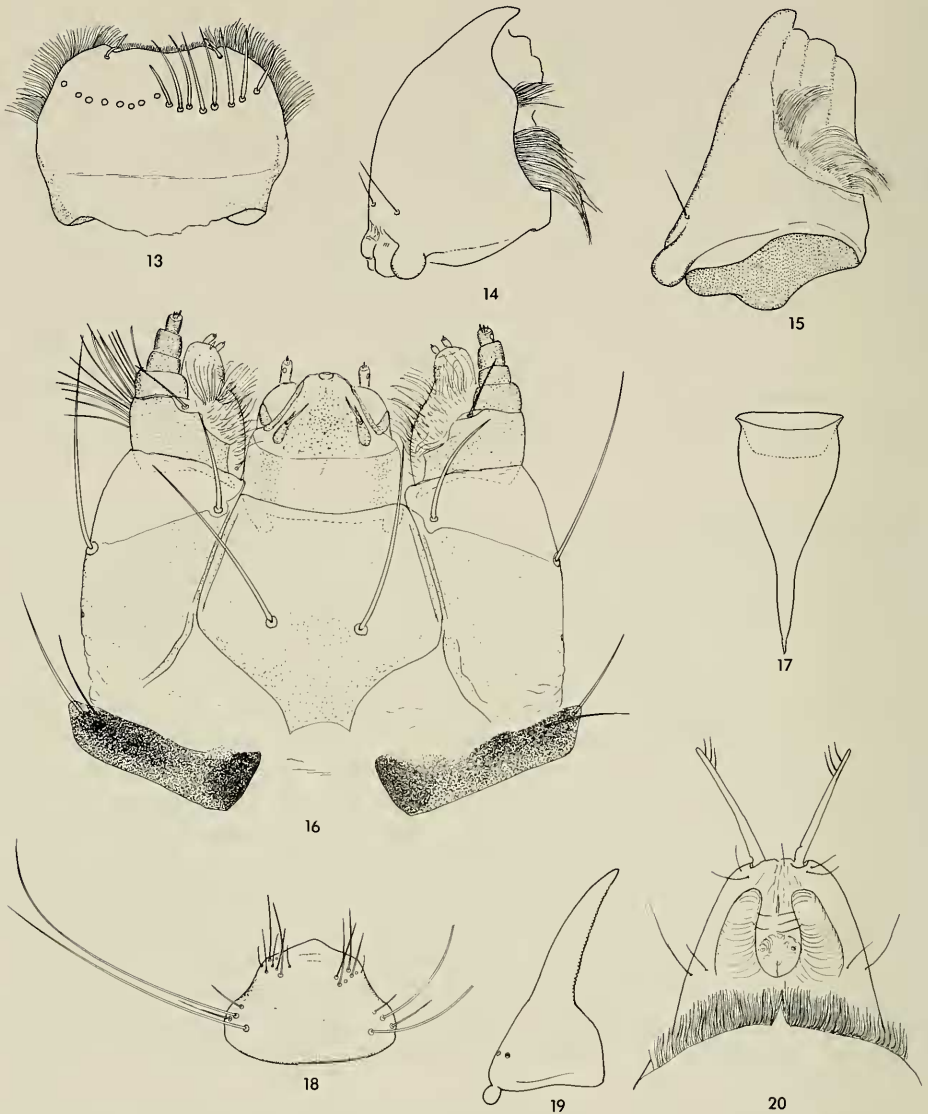
femur, tibia and tarsus with row of very short, pale setae; tibia with single, large, apical spur. Midleg much elongated, especially tibia and tarsus; ventral margins of femur, tibia and tarsus with row of short, pale setae; tibia with single, large, apical spur. Hindleg very elongate, especially tibia and tarsus; ventral margins of femur, tibia and tarsus with row of minute, pale setae, trochanter with dense brush of short setae midventrally.

Abdomen with gills in clusters of 3 or 2, as shown in Fig. 12. Lateral line of short, fine, pale hairs from posterior of segment 2 to posterior of segment 7. Bifid processes in curved line laterally on segment 8. Groove between metathorax and first segment ventrolaterally with small sclerotized area, not produced into any type of lobe. First segment dorsally with low, posteromesal hump; with low, ventrolateral humps, each bearing broad, crescentic band of small hooks; dorsally with 2 pairs of large setae, lateroventrally with 3 pairs. Eighth tergum with 2 pairs of large setae. Ninth tergite pale, inconspicuous, with pair of large, mesal setae, flanked by 3 or 4 pairs of smaller setae; single lateral and lateroventral pairs of short, dark setae. Anal proleg with 5 long, dark setae along posterior margin; with small, but distinct, posterodorsal carina; membranous ventral portion without setae, but densely spiculate, with row of small, flat, plates appressed to membrane on each side of anal opening.

Pupa. — Length to 14 mm, width 3 mm; female larger than male. Mandible with inflated base, apex long, slightly hooked apicad, inner margin serrate; with 2 long setae externally near base. Labrum small, rounded; with basolateral cluster of 2 long and 2 short setae, and apicolateral cluster of about 10 straight setae. With 2 long setae between eye and base of mandible, 2 pairs of long setae on face, pair between antennae, another shorter pair just posteriad of antennae, and 3 pairs posterolaterally on dorsum. Basal antennal segment with row of 3–4 long setae dorsally and cluster of 6–8 shorter setae ventrolaterally.

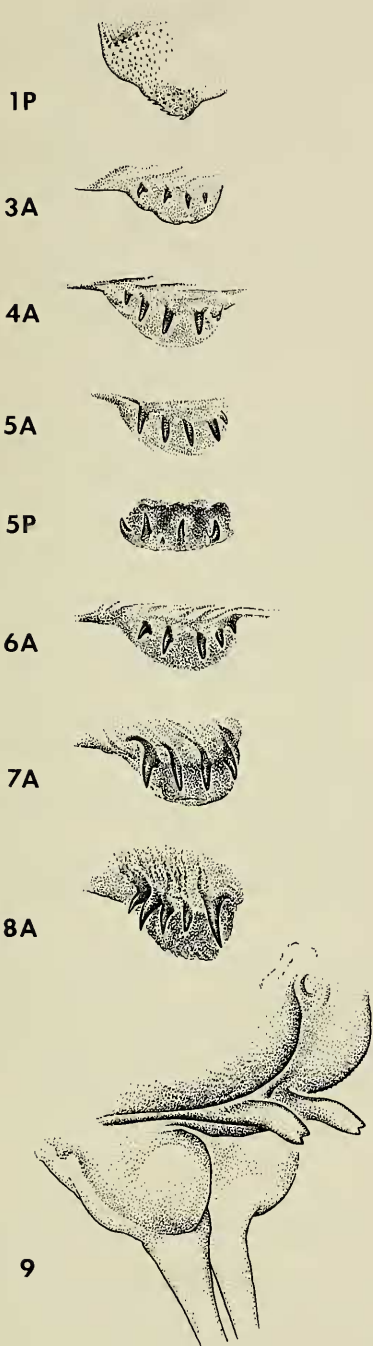
Pronotum with 2 setae on each side dorsolaterally. Mesonotum with tegular area bearing cluster of about 12 setae; dorsum with 3 pairs of setae. Metanotum with 3 pairs of setae. Tarsus of midleg with well-developed swimming fringe.

Abdomen with gills essentially as in larva; dorsal gills often aborted. Lateral line of long, fine hair; from anterior of segment 3 to posteriad of segment 8 where

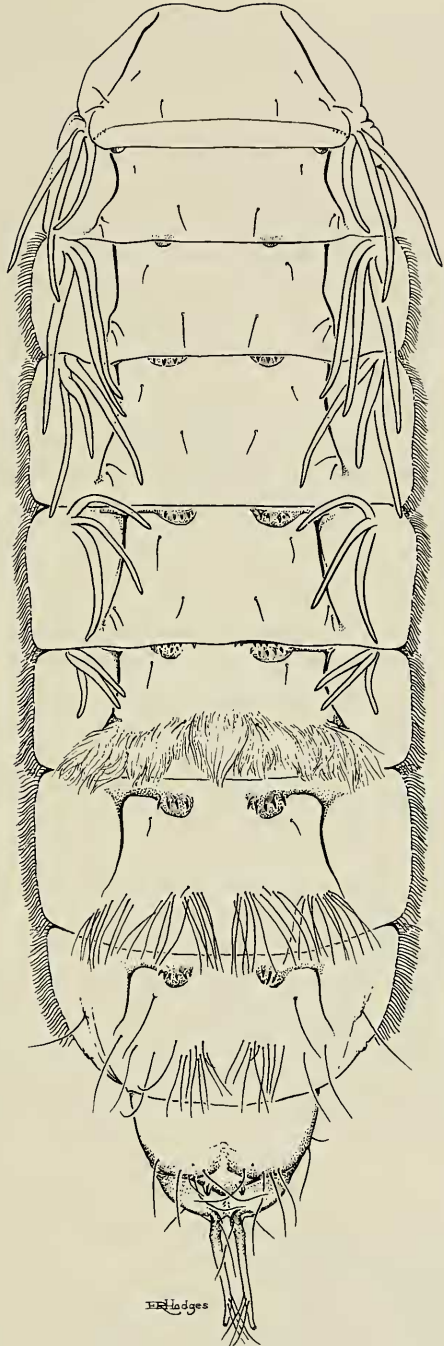


Figs. 13–20. *Banyallarga argentinica*: 13, Larval labrum, dorsal; 14, Larval mandible, lateral; 15, Larval mandible, mesal; 16, Larval maxillolabium, ventral; 17, Larval gular sclerite, ventral; 18, Pupal labrum, anterior; 19, Pupal mandible, anterior; 20, Apex of male pupal abdomen, ventral.

it curves ventrad and almost meets the other side midventrally, hairs longest posteriad. Hook plates anterior on segments 3 to 8, on 5 posteriad; each plate broader than long with single row of 4–5 large hooks. First segment produced slightly posterolaterally, bearing band of small, posteriorly-directed points and small, ovoid sclerite with anteriorly directed points. Terga 1–8 and sterna 2–8 with lateral, band-like sclerites, those of terga with anteromesal extension connecting to hook-plates laterally. Tergum 6 with dense, posterior brush of long, fine setae; terga 7 with 2 pairs of fan-like arrays of long, stiff setae along posterior margin; other terga with only few scattered setae. Tergum 9 with middorsal sclerite



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Figs. 21-22. *Banyallarga argentinica*, pupa: 21, Hook plates, with abdominal segment number and anterior or posterior position; 22, Abdomen, dorsal. Drawings by Smithsonian staff artist, Mrs. Elaine R. Hodges.

bearing pair of upright sclerotized processes; segment 9 with scattered long setae. Apical processes long, slender, with single, long, subbasal, and 3 subapical setae; apex flattened and narrowed, scabrous, and upcurved.

Case.—Length to 25 mm, width to 5 mm. Constructed primarily of large sand grains or small rock fragments, often with scattered wood fragments; largest fragments generally placed laterally. Cross-section transversely ovoid; slightly bowed and tapered longitudinally.

Material.—Argentina, Pcia. Jujuy, Yala, Mar 1982 (reared in laboratory), E. B. Angrisano, 12 larvae (including first and second instars), 1 pupa, 8 ♂ pupa, 12 ♀ metamorphotypes, 1 cast skin.—Pcia. Catamarca, Arroyo El Pintado, near La Viña, 18 Oct 1973, O. S. Flint, Jr., 10 larvae.—Pcia. Salta, Payogasta, 13 Oct 1973, O. S. Flint, Jr., 13 larvae.—Salta, 17–18 May 1967, P. J. Spangler, 25 larvae. Cañada la Gotera, route 59, km 23.5, 16–17 Oct 1973, O. S. Flint, Jr., 100 larva.—Pcia. Tucuman, Hualinchay, 17 Oct 1973, O. S. Flint, Jr., 1 larva.—15 km west Tucuman, 22 May 1969, P. & P. Spangler, 1 larva.—Siambon, 10 Oct 1973, O. S. Flint, Jr., 1 larva, 1 ♀ metamorphotype.

Biology.—The larvae were found in various aquatic habitats with clean water of slight velocity with a sandy-stoney bottom, with organic matter, and with marginal vegetation. Typically, this is a situation found in slow streams of only 1 to 5 meters in width or along the margins or pools in rapid streams. They were also found tolerating extreme situations in overflow marshes, without water renewal and subject to daytime warming. In all cases they were abundant, being the numerically dominant trichopteran.

They are moderately active, and are found indiscriminately on the bottom or among the aquatic vegetation. They eat periphyton and organic detritus and show a liking for live food when it is offered. The adults were encountered in the vegetation immediately adjacent, in cooler and shadier spots.

An egg mass was found with about 100 eggs, which hatched—after being taken to the laboratory—about 15 days later.

Before pupating, the larvae cut the end of their case so that it takes on a more cylindrical aspect. In this stage they are most frequently on the bottom, until finally they attach themselves to stones and close the case, leaving the free end lightly interred in the sand. The duration of the pupal stage was 18 days (range 15–22), the adults emerged 110 days (95–120) after eclosion of the larvae.

Apparently they are found during the whole year.

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